WHAT IS CLAIMED IS:

1. A method of determining an output sequence of states in a finite state machine from an at least one input start state to an at least one input goal state, performed by a data processing system having a memory, comprising the steps of:

determining an overapproximated path through the finite state machine, from an at least one first start state to an at least one first goal state, using a formal method, wherein the formal method is applied to a matrix comprised of state sets, the matrix being organized by time-steps along a first dimension and by partitions of state bits along a second dimension;

determining a formally constrained underapproximated path that lies along the overapproximated path, the constrained path being of at least one time-step and comprising at least one state of the finite state machine;

combining the constrained underapproximated path with the output sequence of states such that an updated output sequence of states and an updated at least one first start state are determined;

ending a search, if the updated output sequence of states comprises at least one state of the at least one input start state and the at least one input goal state, but otherwise repeating the above steps.

2. The method of claim 1, wherein determining the overapproximated path is performed by a first process that is independent of a second process for determining of the formally constrained underapproximated path.

3. The method of claim 2, wherein the first process and second process exist concurrently.

4. The method of claim 2, wherein the first process spawns the second process.

5. The method of claim 2, wherein the repeating of steps is accomplished by spawning additional independent processes.

6. The method of claim 2, wherein the first process spawns a third process for determining a second overapproximated path that comprises the overapproximated path of the first process.

7. The method of claim 2, wherein the second process spawns a third process for determining a second constrained underapproximated path.

8. The method of claim 6, wherein third process has a third priority level and the first process has a first priority level.

9. The method of claim 7, wherein the second process has a second priority level and the third process has a third priority level.

10. The method of claim 1, wherein determining the overapproximated path comprises the steps of:

applying a first formal method to augment the matrix, along the first dimension, until a time step is produced that comprises at least one state of the at least one first goal state; and

applying a second formal method to lessen an amount of overapproximation of the matrix resulting from the first formal method.

11. The method of claim 1, wherein a first time-step of the matrix is comprised solely of a state or states reachable by the finite state machine in zero or more time-steps from the at least one input start state.

12. A method of determining an overapproximated path in a finite state machine from an at least one first start state to an at least one first goal state,

performed by a data processing system having a memory, comprising the steps of:

applying a first formal method to augment a matrix, along a first dimension, until a time step of the first dimension is produced that comprises at least one state of the at least one first goal state;

applying a second formal method to lessen an amount of overapproximation of the matrix resulting from the first formal method; and

wherein the matrix is comprised of state sets, is organized by time-steps along a first dimension, is organized by partitions of state bits along a second dimension, and the first time-step of the matrix is comprised solely of one or more states reachable by the finite state machine in zero or more time-steps from the at least one first start state.

13. The method of claim 12, wherein the second formal method narrows a target state set at a first time step by utilizing a first set of an earlier time step, wherein the first state set is in the fanin of target state set.

14. The method of claim 12, wherein the second formal method narrows a target set at a first time step by utilizing a first state set at a later time step, wherein the first state set is in the fanout of target set.

15. The method of claim 14, wherein the target set is a state set.

16. The method of claim 14, wherein the target set is an input set.

17. The method of claim 14, wherein the second formal method also utilizes at least one sibling set at an earlier time step than the first state set, wherein the at least one sibling set is in the fanin of the first state set.

18. The method of claim 17, wherein the at least one sibling set comprises a state set.

19. The method of claim 17, wherein the at least one sibling set comprises an input set.

20. The method of claim 13, wherein the second formal method is applied to the matrix in response to an event narrowing the first set.

21. The method of claim 14, wherein the second formal method is applied to the matrix in response to an event narrowing the first state set.

22. The method of claim 17, wherein the second formal method is applied to the matrix in response to an event narrowing an at least one sibling set.

23. The method of claim 13, wherein the first set is a state set.

24. The method of claim 13, wherein the first set is an input set.

25. The method of claim 12, wherein the second formal method is applied as follows:

retrieving a current target state set, of a first time step, from a list of forward narrowing targets;

performing a forward narrowing of the current target state set, by utilizing a first set of a time step earlier than the first time step, wherein the first set is in the fanin of current target state set;

identifying additional forward narrowing targets, resulting from the forward narrowing of the current target state set;

adding the additional forward narrowing targets to the list of forward narrowing targets;

repeating the above steps if the list of forward narrowing targets contains targets for forward narrowing.

26. The method of claim 23, wherein the list of forward narrowing targets is ordered by increasing time step of a target state set upon the addition of the additional forward narrowing targets.

27. The method of claim 12, wherein the second formal method is applied as follows:

retrieving a current state set, of a first time step, from a list of reverse narrowing sources;

performing a reverse narrowing of a current target set, by utilizing the current state set, wherein the current target set is in the fanin of current state set and the current target set is at an earlier time step than the first time step;

identifying additional reverse narrowing targets, resulting from the reverse narrowing of the current target set;

adding the additional reverse narrowing sources to the list of reverse narrowing targets based upon the identified additional reverse narrowing targets;

repeating the above steps if the list of reverse narrowing sources contains state sets.

28. The method of claim 27, wherein the list of reverse narrowing sources is ordered by decreasing time step of a state set upon the addition of the additional reverse narrowing sources.

29. A data processing system having a memory, for determining an output sequence of states in a finite state machine from an at least one input start state to an at least one input goal state, comprising:

a subsystem configured to determine an overapproximated path through the finite state machine, from an at least one first start state to an at least one first goal state, using a formal method, wherein the formal method is applied to a matrix comprised of state sets, the matrix being organized by time-steps along a first dimension and by partitions of state bits along a second dimension;

a subsystem configured to determine a formally constrained underapproximated path that lies along the overapproximated path, the constrained path being of at least one time-step and comprising at least one state of the finite state machine;

a subsystem configured to combine the constrained underapproximated path with the output sequence of states such that an updated output sequence of states and an updated at least one first start state are determined;

a subsystem configured to end a search, if the updated output sequence of states comprises at least one state of the at least one input start state and the at least one input goal state, but to otherwise repeat application of the above circuits.

30. A data processing system having a memory, for determining an overapproximated path in a finite state machine from an at least one first start state to an at least one first goal state, comprising:

a subsystem configured to apply a first formal method to augment a matrix, along a first dimension, until a time step of the first dimension is produced that comprises at least one state of the at least one first goal state;

a subsystem configured to apply a second formal method to lessen an amount of overapproximation of the matrix resulting from the first formal method; and

wherein the matrix is comprised of state sets, is organized by time-steps along a first dimension, is organized by partitions of state bits along a second dimension, and the first time-step of the matrix is comprised solely of one or more states reachable by the finite state machine in zero or more time-steps from the at least one first start state.

31. A computer program product comprising:

a computer usable medium having computer readable code embodied therein for causing a data processing system having a memory to determine an output sequence of states in a finite state machine from an at least one input

start state to an at least one input goal state, the computer program product including:

computer readable program code devices configured to cause a computer to effect determining an overapproximated path through the finite state machine, from an at least one first start state to an at least one first goal state, using a formal method, wherein the formal method is applied to a matrix comprised of state sets, the matrix being organized by time-steps along a first dimension and by partitions of state bits along a second dimension;

computer readable program code devices configured to cause a computer to effect determining a formally constrained underapproximated path that lies along the overapproximated path, the constrained path being of at least one time-step and comprising at least one state of the finite state machine;

computer readable program code devices configured to cause a computer to effect combining the constrained underapproximated path with the output sequence of states such that an updated output sequence of states and an updated at least one first start state are determined;

computer readable program code devices configured to cause a computer to effect ending a search, if the updated output sequence of states comprises at least one state of the at least one input start state and the at least one input goal state, but otherwise repeating the above steps.

32. A computer program product comprising:

a computer usable medium having computer readable code embodied therein for causing a data processing system having a memory to determine an overapproximated path in a finite state machine from an at least one first start state to an at least one first goal state, the computer program product including:

computer readable program code devices configured to cause a computer to effect applying a first formal method to augment a matrix, along a first dimension, until a time step of the first dimension is produced that comprises at least one state of the at least one first goal state;

computer readable program code devices configured to cause a computer to effect applying a second formal method to lessen an amount of overapproximation of the matrix resulting from the first formal method; and

wherein the matrix is comprised of state sets, is organized by time-steps along a first dimension, is organized by partitions of state bits along a second dimension, and the first time-step of the matrix is comprised solely of one or more states reachable by the finite state machine in zero or more time-steps from the at least one first start state.

33. A data-carrying signal representing sequences of instructions which, when executed by a data processing system, cause determination of an output sequence of states in a finite state machine from an at least one input start state to an at least one input goal state by performing the steps of:

determining an overapproximated path through the finite state machine, from an at least one first start state to an at least one first goal state, using a formal method, wherein the formal method is applied to a matrix comprised of state sets, the matrix being organized by time-steps along a first dimension and by partitions of state bits along a second dimension;

determining a formally constrained underapproximated path that lies along the overapproximated path, the constrained path being of at least one time-step and comprising at least one state of the finite state machine;

combining the constrained underapproximated path with the output sequence of states such that an updated output sequence of states and an updated at least one first start state are determined;

ending a search, if the updated output sequence of states comprises at least one state of the at least one input start state and the at least one input goal state, but otherwise repeating the above steps.

34. A data-carrying signal representing sequences of instructions which, when executed by a data processing system, cause determination of an

overapproximated path in a finite state machine from an at least one first start state to an at least one first goal state by performing the steps of:

applying a first formal method to augment a matrix, along a first dimension, until a time step of the first dimension is produced that comprises at least one state of the at least one first goal state;

applying a second formal method to lessen an amount of overapproximation of the matrix resulting from the first formal method; and

wherein the matrix is comprised of state sets, is organized by time-steps along a first dimension, is organized by partitions of state bits along a second dimension, and the first time-step of the matrix is comprised solely of one or more states reachable by the finite state machine in zero or more time-steps from the at least one first start state.